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ABSTRACT

Prevalence rates of cognitive impairment in persons 75 to 85 years of age have been documented in the range of 10-15%, and exceeding 20% after age 85. A recent study has demonstrated even higher prevalence rates: 18.7% between the ages of 75-84 and 47% in persons over 85 years of age. Screening for dementia in persons 75 years of age and older would therefore identify a significant number of impaired individuals. Identification of potentially impaired individuals by mental status screening and the initiation of measures to control risk factors associated with multi-infarct dementia or Alzheimer's dementia may prove to be a powerful argument for making the diagnosis of dementia at an early stage. This study was conducted to explore the feasibility of group screening for cognitive impairment and to compare the results obtained with a well-validated, individually administered screening test. The Folstein Mini-Mental State Examination (MMSE) was modified for use in a group setting. Community volunteers were tested as a group in two settings, a geriatric health fair and a special exercise class for the elderly. Subjects were subsequently tested individually using the standard MMSE. A Pearson correlation of 0.90 indicated a high degree of concurrent validity between the two methods of mental status screening. This pilot study suggests that screening for cognitive dysfunction in a group setting may be a useful addition to currently used methods for detecting dementia. (Author/NB)

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EVALUATION OF COGNITIVE FUNCTION IN THE GROUP SETTING

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EVALUATION OF COGNITIVE FUNCTION IN THE GROUP SETTING

ABSTRACT

In population screening for cognitive impairment in persons 75 years and older, an instrument that could be administered to a group of persons would be both cost effective and provide better use of health-manpower resources. Potential problems and benefits associated with earlier identification of cognitively impaired persons are discussed. Data from a pilot study utilizing a group-administered instrument are presented.

INTRODUCTION

Screening for dementia in persons 75 years and older would result in the identification of a significant number of impaired individuals. Several population-based studies have documented prevalence rates of 10%-15% in persons 75-85 years of age, and greater than 20% in persons over 85 years (Kay, 1977; Cavanaugh, 1983; Hagnell et al., 1981). A recent study conducted in a geographically defined, urban, working class community of approximately 32,000 persons, demonstrated prevalence rates much higher than previously reported. They estimated a prevalence rate of 18.7% in persons between the ages of 75-84 years and 47% in persons over 85 years. (Evans et al., 1989).

Despite the common occurrence of cognitive impairment in the elderly, primary care physicians seldom formally test patients' mental status, and usually do not make the diagnosis until the problem is moderately advanced, or is brought to their attention by family or friends of the individual.(Mant et al., 1988) Assuming availability of reasonably sensitive and specific test instruments, formal screening for cognitive function would potentially identify impaired persons at an earlier stage.

Given the usually accepted prerequisites for screening for specific diseases, does screening for dementia make sense? Screening instruments are available that are easily administered, inexpensive, and yield results that are reasonably sensitive and specific in both healthy and impaired persons. A debatable issue is whether early recognition of dementia will make any difference in beneficial outcomes. Since dementia is a symptom complex and not a disease entity, outcomes will vary depending on the specific disease causing the dementia. Utilizing criteria described in the Diagnostic and Statistical Manual of the American Psychiatric Association, approximately 20% of persons identified as demented will have conditions amenable to treatment. Depression, drugs, endocrine disorders, nutritional deficiency states, intracranial diseases such as infection, tumor, and normal pressure hydrocephalus are some of the more common causes of so-called reversible dementia. Earlier identification and intervention in those persons potentially would result in significant benefit. Unfortunately the vast majority of persons identified will have one of

the primary degenerative dementias, for which we presently can presently offer little in regard to curative treatment. Early recognition and intervention in those individuals can result in a lessening of the burden of illness to the caregivers and patient. Such intervention would include caregiver support in educating them about the disease; involving them in support groups; putting them in touch with a variety of support services such as nutritional support; transportation services designed specifically for the impaired elderly; day care; respite care; home health services; volunteer services, and a host of other patient and family aids available in most communities. Many studies have documented the value of such interventions but none have looked at whether initiation of those services at an earlier stage of dementing illness would make a difference in overall outcomes. (Chiverton et al., 1989; Lipkin et al., 1987; Chot et al., 1983; Brody et al., 1978).

Another potential benefit of early detection of the demented person is the initiation of a comprehensive evaluation. Comprehensive geriatric assessment has been shown in a variety of settings to reduce over-all health care costs, reduce the number of hospitalizations, detect unrecognized diseases, reduce the need for nursing home placement and increase utilization of home health services. (Sloane et al., 1980, 1985; Rubenstein et al., 1984; Applegate et al., 1983; Williams et al., 1973; Williams et al., 1986).

Preliminary but encouraging evidence is emerging that suggests that optimal control of risk factors in patients with multi-infarct dementia may improve cognitive function. (Rogers et al., 1983, 1985; Judd et al., 1986). These risk factors include, hypertension, cigarette smoking, diabetes mellitus, hyperlipidemia and heart disease. Identification of potentially impaired individuals by mental status screening, and the initiation of measures to control risk factors associated with multi- infarct dementia may prove to be a powerful argument for making the diagnosis of dementia at an early stage.

In summary screening for dementia does make sense for several reasons. These include the protracted course of the disease; the essential part played by the family and other caregivers; the potential value of early comprehensive assessment; identification of reversible causes; the potential that control of risk factors may improve cognitive function in

some individuals with dementia; and the availability of a vast array of support services. (Meyer et al., 1983)

Dementia detected by a group screening instrument would have to be investigated by generally accepted diagnostic criteria. Persons identified as abnormal could be in the false positive category or be suffering from a variety of systemic disorders known to impair cognitive function. (Rabins et al., 1983). Early identification of persons with reversible dementia would allow for initiation of appropriate treatment. On the other hand, persons with primary degenerative dementia such as Alzheimer's disease or Multi-infarct dementia, although not curable, would potentially benefit from early initiation of support services.

The purpose of this pilot study was to explore the feasibility of group screening for cognitive impairment by using an instrument designed to closely parallel an already validated mental status screening test. If group administered testing could yield results comparable to individual screening, it would offer a cost effective alternative. Individual testing could then be a second stage of the screening process in which more extensive evaluation would be limited to a smaller sample. This would better utilize already questionably adequate health manpower resources. (D'Elia, Spencer, 1986).

METHODS

Numerous validated mental status screening tests described in the medical literature were considered by the authors for adaptation to group administration. (Rosenthal, 1984; Folstein et al., 1975; Plutchik et al., 1971; Nelson et al., 1986; Eastwood et al., 1983; Eslinger et al., 1985). In selecting a reference test, several criteria were deemed important including, (1) ease of administration; (2) reasonably short time required to test; (3) broad range of functions tested; (4) a widely used and accepted test. Once we chose a validated reference test, we then designed a group test that to a significant extent paralleled the reference screening test. The authors selected the Mini-Mental State (MMSE) examination as described by Folstein. Some questions included in the MMSE had to be dropped or modified to allow for group testing, these included Repetition, Three-minute recall, three-step command, and interpretation of written material (i.e.,"close your eyes"). See Appendix

I for the instrument used in this study.

Two groups of volunteers were tested, one at a health fair sponsored by a local County Health Department, and a second group of seniors participating in a special exercise class. Informed consent was obtained from persons agreeing to participate in the study. At each site we planned to test between twenty and thirty individuals. The person administering the test presented the questions to the group and the persons taking the test recorded their answers on an answer sheet. To test three-minute recall, answer sheets were collected and the recalled words were recorded on a second answer sheet. To test three-step command, they were asked to place their answer sheet in an envelope (handed out with answer sheet), write their name on the envelope, and seal the envelope. When their materials were collected, compliance with the three-step command could be easily tabulated. Following the group testing, individuals were contacted to arrange for individual testing using the standard MMSE screening test.

The person administering the individual test was blinded to the results of the group test. Some persons tested in the group setting (health fair) could not be located and others were not interested in individual testing. Persons taking the test completed a questionnaire that asked for the name of their primary health care provider and for permission to send test results to that person. A letter was sent to the primary care provider for persons not agreeing to individual testing, describing the study and test results and advising follow-up if, in their clinical judgement, it seemed warranted. Persons who had individual testing following the group testing, and who scored below the normal range (24-30), were advised to contact their doctor. In addition, we asked their permission to send the results to their physician explaining the nature of the study and advising follow-up if in their clinical judgement it seemed warranted. Because the modifications made to adapt the Folstein MMSE for group administration were minor, we were assuming this was not a new test. However, the number of items on the two versions, 30 on the individually administered test and 28 on the group test, did affect the numerical scores. In order to compare the two sets of scores, a simple transformation of scores into percentages of correct items was done.

Using eighty percent correct as the norm described by Folstein, the cutting point for the Folstein MMSE as 24, and the cut point for the group administered test was 22.6.

To justify the assumption that the two forms of the test were comparable, a correlation coefficient of sufficient magnitude would establish concurrent validity for the new form (Anastasi, 1976). Difference of means tests were done to compare the group who took only the group-administered test with those who took both forms of the test to see if there were differences in demographic variables or mental status scores.

RESULTS

Two groups totaling 53 persons were tested. There were 41 females (77.4%) and 12 males (22.6%). The average age was 73 years with a range of 53 to 88 years. The average education was 11.2 years, with a range of 1 to 20 years. Of the 53 persons tested with the group tests, 26 also took an individually-administered standard Folstein mental status examination. Of these, 20 (77%) were female and 6 (23%) were male. The mean education was 11.5 years compared to 10.9 years for the sample who took only the group test. The mean age was 71.3 compared to 74.5 for those who took the individual versus the group test. The differences in age and education between the two groups were not statistically significant. The mean score on the group administered mental status test for the 27 persons who took only the group test was 21.4; the mean for the group who took both tests was also 21.4. In regard to their mean scores the group who did not return to take the individual test did not differ significantly from those persons who took both the group and individually administered MMSE. ($T = 0.03$ $p < 0.975$)

Study participants' scores for both the group-administered test and individually-administered test, and the adjusted group scores, are shown in Table I. Pearson's correlation coefficient calculated for those subjects tested in both the group and individual setting was 0.9. Although we requested exclusion of persons with significant hearing loss two such persons were included. It was obvious on individual testing that these individual were severely hearing impaired. We decided not to exclude them from the statistical

analysis in calculating the Pearson correlation coefficient. Table 1 shows raw scores and percentages correct for the individual MMSE, and the group examination. Figure 1 shows the discrepancies in the percentages correct for the individual Folstein MMSE and the group-administered test. Individuals F and I were identified as hearing impaired. Their group scores are much lower than their individual scores.

A paired t-test was run on all persons (excluding the two hearing impaired subjects) for whom both group and individual test scores were available. Correcting for the difference in the number of test items in the group administered test compared to the standard MMSE (28 verses 30), the mean difference in scores was 1.3 with a standard deviation of 1.8.

This means that on average persons taking the group administered test scored 1-2 points lower than when tested on an individual basis. Environmental distractions and perhaps reluctance to ask for clarification in a large group setting are possible reasons for slightly lower scores on the group test.

As can be seen in Appendix I, several questions not part of the standard MMSE examination were presented to individuals in both the group and individual testing. These questions covered cognitive areas not assessed in the MMSE, such as attention, proverb interpretation, judgement, reproduction of a three dimensional figure, and word fluency. These items were being field tested and were not intended to be included in our analysis as presented in this paper. Those items that were shown to yield consistent results in group verses individual testing will be utilized in an expanded group administered test that will cover cognitive areas known to be affected relatively early in dementia syndromes but are not tested in the standard MMSE and other clinically applied mental status screening tests.

DISCUSSION

Significant practical, medical, ethical and socio-economic issues need to carefully considered before launching any effort to identify community-based persons with cognitive

impairment by the use of a group-administered screening instrument. (Henderson et al., 1978). The instrument used in this pilot study was designed to closely parallel an already validated test, the "Mini-Mental State" examination (MMSE). Not surprisingly this study demonstrated that a group administered test could be given to literate persons and produce results essentially equivalent to one-on-one testing.

The problems encountered in considering the results of such testing are similar to other already described screening tests for dementia. Anthony reviewed the limits of the MMSE as a screening test.(Anthony et al., 1982) In the inpatient setting with a cut-off of 0-23 as abnormal and 24-30 as normal, it was shown to be 87% sensitive and 82% specific; a false positive rate of 39.4% and a false negative rate of 4.7%. Since all false positives in his analysis had less than a ninth-grade education, eliminating those individuals from the screening process would most likely eliminate an unacceptably high false positive rate. If one were to pursue population screening for cognitive dysfunction one would need to develop a non-literacy based screening instrument to avoid the problems encountered in using MMSE or other similar literacy based tests.

The costs of evaluating large numbers of persons identified as abnormal could prove prohibitive at current medicare and medicaid reimbursement levels. In personal communication with several directors of geriatric assessment units, and in the authors' personal experience, medicare and medicaid reimburse for approximately 25-35% of usual and customary charges for a dementia work-up. Physicians who accept medicare assignment will likely be unable to accept large numbers of patients for evaluation, with reimbursement far below their operating costs. Physicians who do not accept medicare assignment may well be out of reach of the poor, and persons living on modest fixed incomes. Since the most rapidly growing portion of the over 65 year old population are minority groups, and these persons are least likely to seek or afford comprehensive evaluation, any population-based mental status screening program would tend to discriminate against the poor, resulting in less than adequate follow-up services for those individuals. (McConnell et al., 1988; Shapiro et al., 1985; Wolinsky et al., 1988).

The lack of adequate numbers of physicians with sufficient expertise to assess the validity of the results of the screening tests could be problematic. Solomon discussed geriatric health manpower issues and predicted a need for 7000-8000 trained geriatrician by the year 1990. (Solomon et al., 1980) In the Spring of 1987 approximately 3000 physicians passed a board examination certifying added qualification in geriatrics. If this represents the pool of "qualified" geriatricians, we are far short of projected needs. With the rapid expansion of the number of geriatric fellowship training programs nationally, we can expect this pool of trained geriatricians to gradually improve. In the interim, however, "experts' in the area of dementia evaluation will be in short supply.

Changes in cognitive function associated with early dementia are difficult to distinguish from benign memory loss. (Brayne et al., 1988; Branconnier et al., 1982; Kval, 1962). Since often the only way to tell the difference is to do repeated evaluations on a semi-annual or annual basis, persons identified in a borderline abnormal range would have to face an uncertain future over a protracted time. One could certainly argue that little can be done in the earlier stages of a developing dementia syndrome, and that the anguish raised by early recognition is not justified by the amount of disability present, or the interventions presently available. On the other hand, there is data to suggest that attention to risk factors such as hypertension and smoking may improve cognition in persons with multi-infarct dementia. (Judd et al., 1986). Unfortunately as yet, there is no intervention that will slow the relentless progression of intellectual loss associated with Alzheimer's disease. The only justification for early detection of this disease at the present time is the potential benefit to be gained by initiation of comprehensive assessment and the resulting utilization of appropriate support services for affected individuals and caregivers. The benefits of many of the recommended interventions have not been scientifically studied and are mostly anecdotal reports by geriatric specialists. (Robinson, 1986; Winograd et al., 1986). Participants in a mental status screening program would need to be fully informed of the limitations of the test and be willing to have adequate follow-up of abnormal results. In addition, counseling by mental health professionals would need to be available to persons

who might require such support.

The authors present the results of a pilot study using a mental status screening instrument designed to be administered in the group setting. A high correlation between the test instrument administered in the group setting and the individually administered MMSE was demonstrated. The authors are planning development of an expanded group-administered instrument that will test a broader array of cognitive functions and offer testing options for illiterate persons. Norms will need be established by comprehensive evaluation of study subjects by a team of expert clinicians. Such an instrument may prove to be useful in population-based screening programs designed to identify persons in need of thorough evaluation and potential diagnosis of dementing illness at an earlier stage.

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Table 1. Comparison of individual Folstein MMSE scores with group-administered test scores

Individual ID	Individual Folstein		Group Administered	
	Score	%	Score	%
A	29	97	28	100
B	30	100	27	96
C	28	93	27	96
D	29	97	25	89
E	22	73	20	71
F*	26	87	16	57
G	23	77	20	71
H	23	77	20	71
I*	21	70	8	28
J	28	93	22	78
K	30	100	27	96
L	22	73	18	64
M	29	97	26	93
N	30	100	28	100
O	30	100	28	100
P	23	77	18	64
Q	19	63	12	43
R	28	93	22	78
S	21	70	18	64
T	29	97	26	93
U	19	63	18	64

Table 1. Comparison of individual Folstein MMSE scores with group-administered test scores, continued

Individual ID	Individual Folstein		Group Administered	
	Score	%	Score	%
V	19	63	14	50
W	21	70	19	68
X	22	73	16	57
Z	29	97	26	93

* These two individuals were later found to be hearing impaired

APPENDIX I

GROUP MENTAL STATUS SCREENING TEST

(these statements and questions were read to the subjects)

Today, I will give you a test that has been used for many years to test mental function. I will also add a few additional questions that I have found to be useful.
I will ask you some questions and you will write your answers on the answer sheet that has been handed out to you.

1. I will say sets of numbers and after each set you should write down the numbers as you recall them. Do not write the numbers until I have finished the entire set.

79

642

9741

36892

741628

1037491

36259761

821943649

2. Write down the names of as many animals as you can think of. You will have one minute to do this. Dont worry about your spelling, I'm only interested in how many you can recall in one minute. Start now.

3. Write down your explanation of the following saying: "A stitch in time saves nine".

GROUP MENTAL STATUS SCREENING TEST

(these statements and questions were read to the subjects)

4. If you found a letter on the sidewalk that was addressed and had an uncancelled stamp on it, what would you do with it? Write your answer in the space on your answer sheet next to question #4

5. What is today's date?

6. What year is it?

7. What month is it?

8. What day in the week is it?

9. What season is it?

10. What is the name of this place?

11. What floor are we on?

12. What is the name of this town?

13. What county is this?

APPENDIX I (cont.)

GROUP MENTAL STATUS SCREENING TEST

(these statements and questions were read to the subjects)

14. What state is this?

Ques. 15, 16, 17.

I will say three words, and I want you to listen carefully, and when I have finished write the words in spaces 15, 16, and 17 on your answer sheet.

The words are: BALL, FLAG, TREE

Try to remember these words because in three minutes I will ask you to recall them.

PLEASE HAND IN YOUR ANSWER SHEET AT THIS TIME. MAKE SURE YOUR NAME IS WRITTEN ON THE SHEET.

WE WILL NOW PASS OUT ANOTHER SHEET. PLACE YOUR NAME ON THIS SHEET.

Ques. 18, 19, 20, 21, 22.

Now I will test your ability to do some simple calculations. Starting with 100, count backwards by subtracting sevens and stop after five subtractions.

Ques. 23, 24, 25.

Now recall the three words I asked you to remember and write them down in the spaces marked 23, 24, 25.

APPENDIX I (cont.)

GROUP MENTAL STATUS SCREENING TEST

(these statements and questions were read to the subjects)

I will show you two objects and I want you to write down the name of the objects in the spaces marked 26 and 27

WATCH, PENCIL

28. Write a short but complete sentence in the space marked 28

29. Copy the figure in this drawing exactly as you see it. Draw it in the space marked 29. (We used a flip chart on which was drawn two intersecting pentagons.)

30. Copy the following figure exactly as you see it. (on a flip chart was drawn a three dimentional cube)

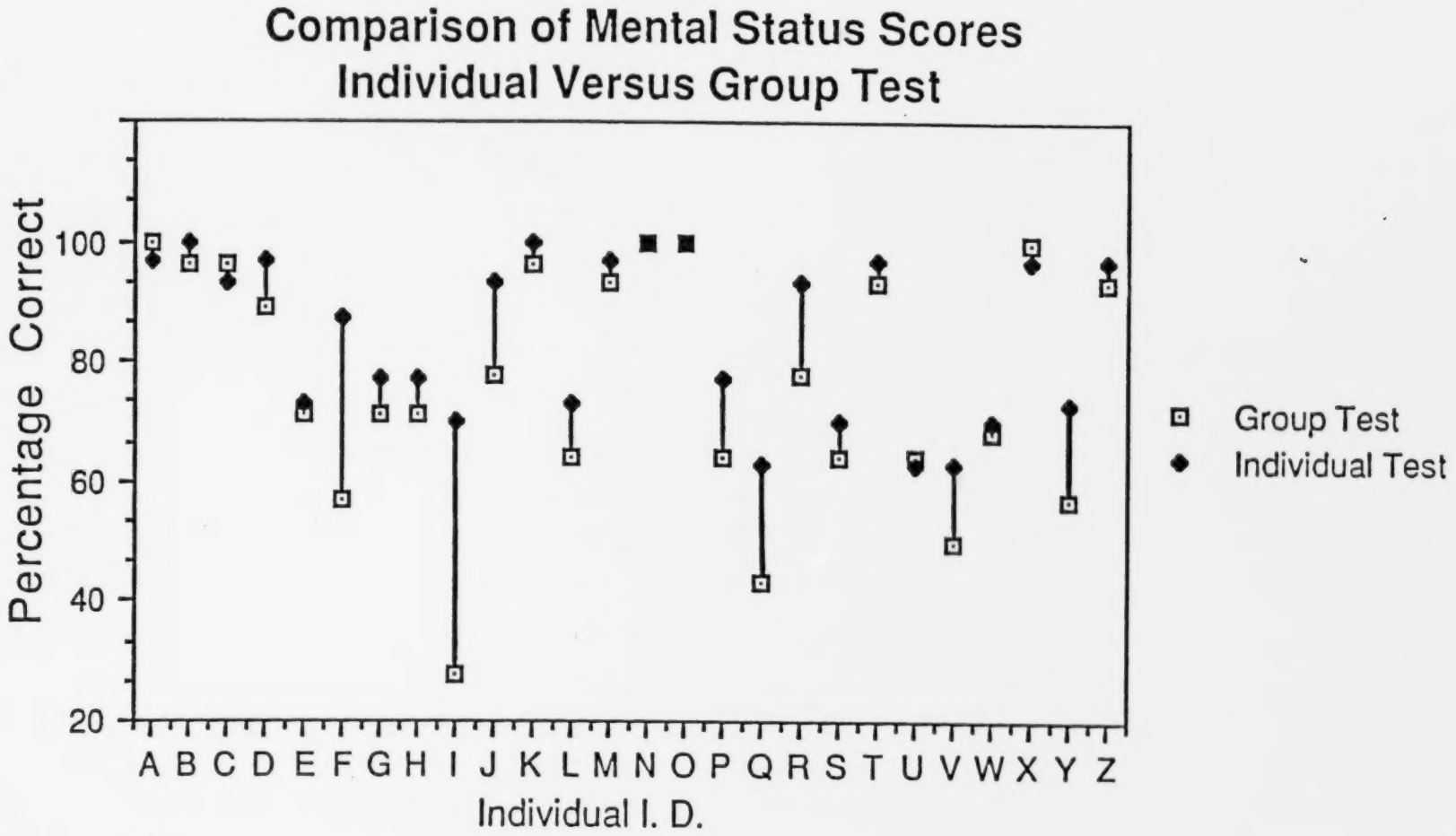
Ques. 31,32,33,34,35,36.

Write down the names of the objects in the drawing. (on a flip chart were drawn six common objects that were shown to the group.)

Ques. 37,38,39.

I will give each of you an envelope, place your answer sheet in the envelope.

Seal the envelope. Then write your name on the front of the envelope.


Comparison of Mental Status Scores
Individual Versus Group Test
Percentage Correct
100
80
60
40
20
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Individual I. D.
Group Test
Individual Test